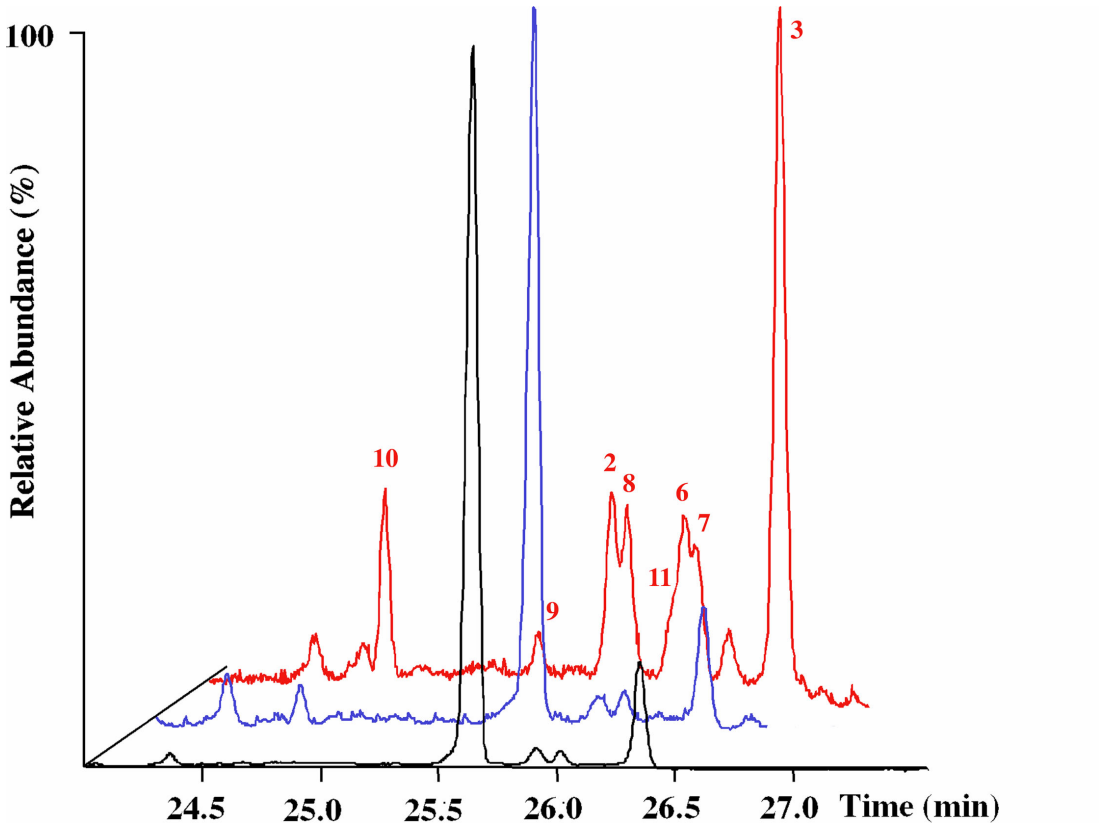

Figure S1: Total ion chromatograms of the products obtained from incubations of FPP with AS (black), ASF178Y (blue), and ASF178V (red). Products are labelled as in the main text.

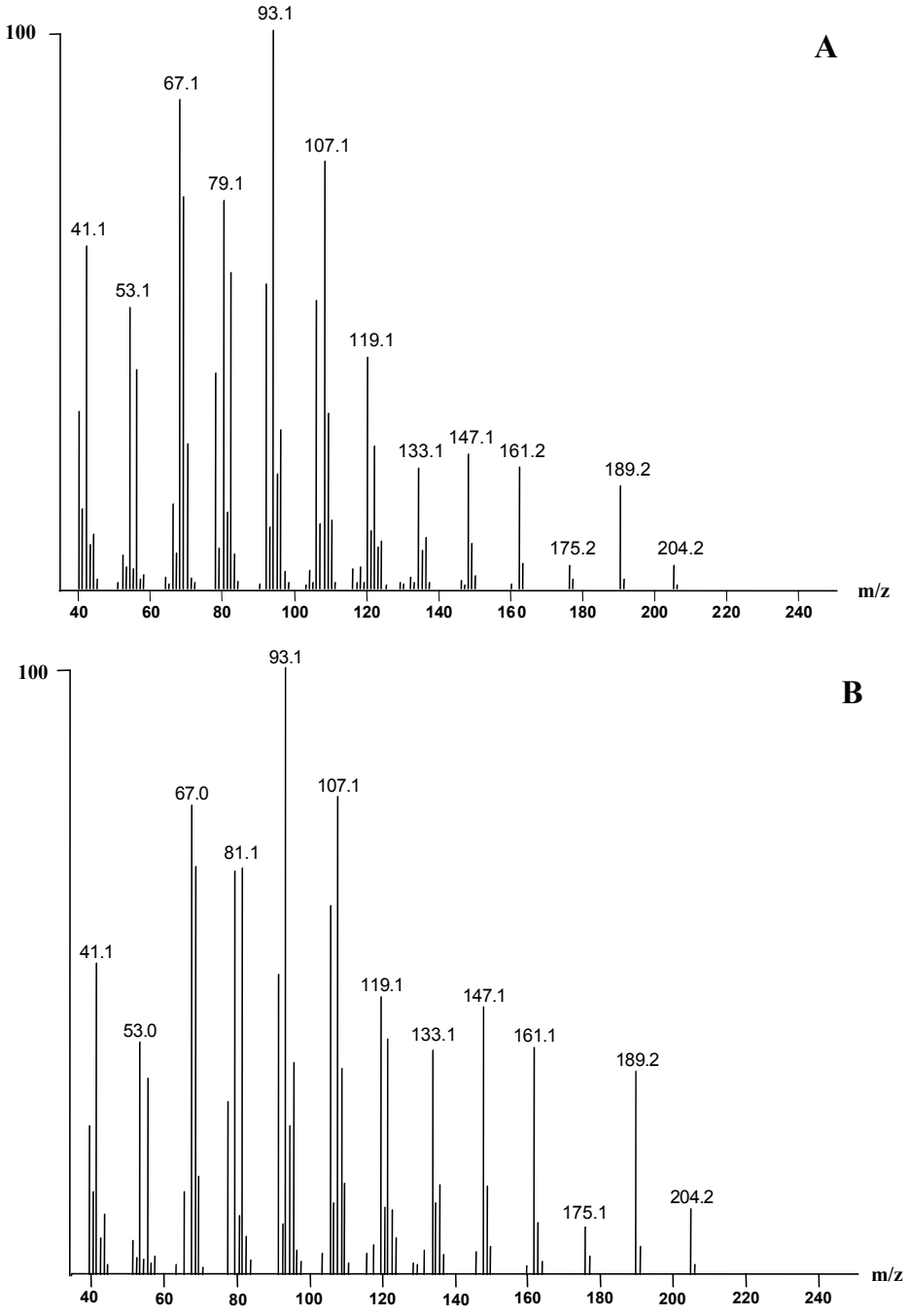

Figure S2: Mass spectra of product **3** from ASF178 catalysis (A) and of authentic germacrene A (B).

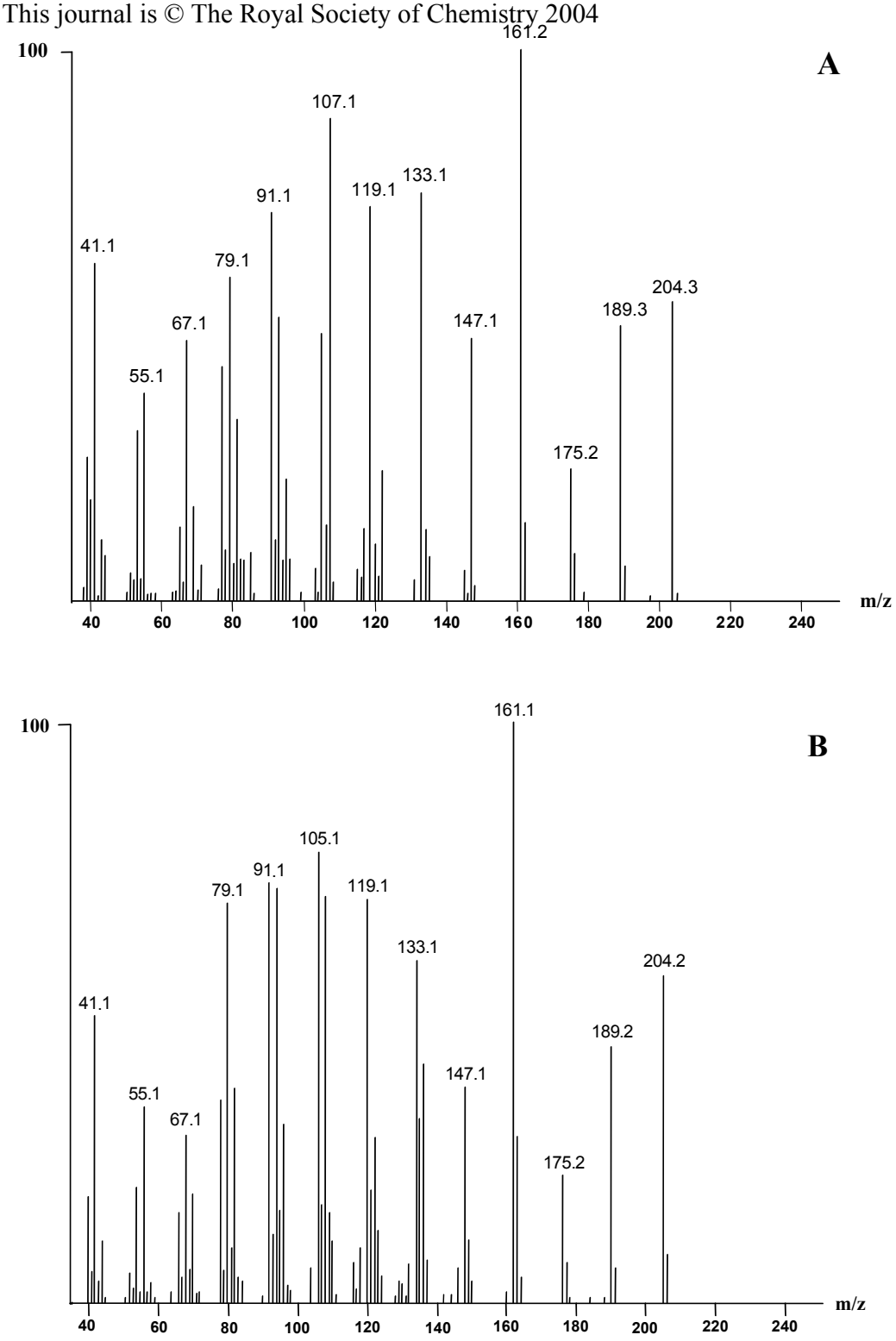

Figure S3: Mass spectra of product **6** from ASF178 catalysis (A) and of authentic valencene (B).

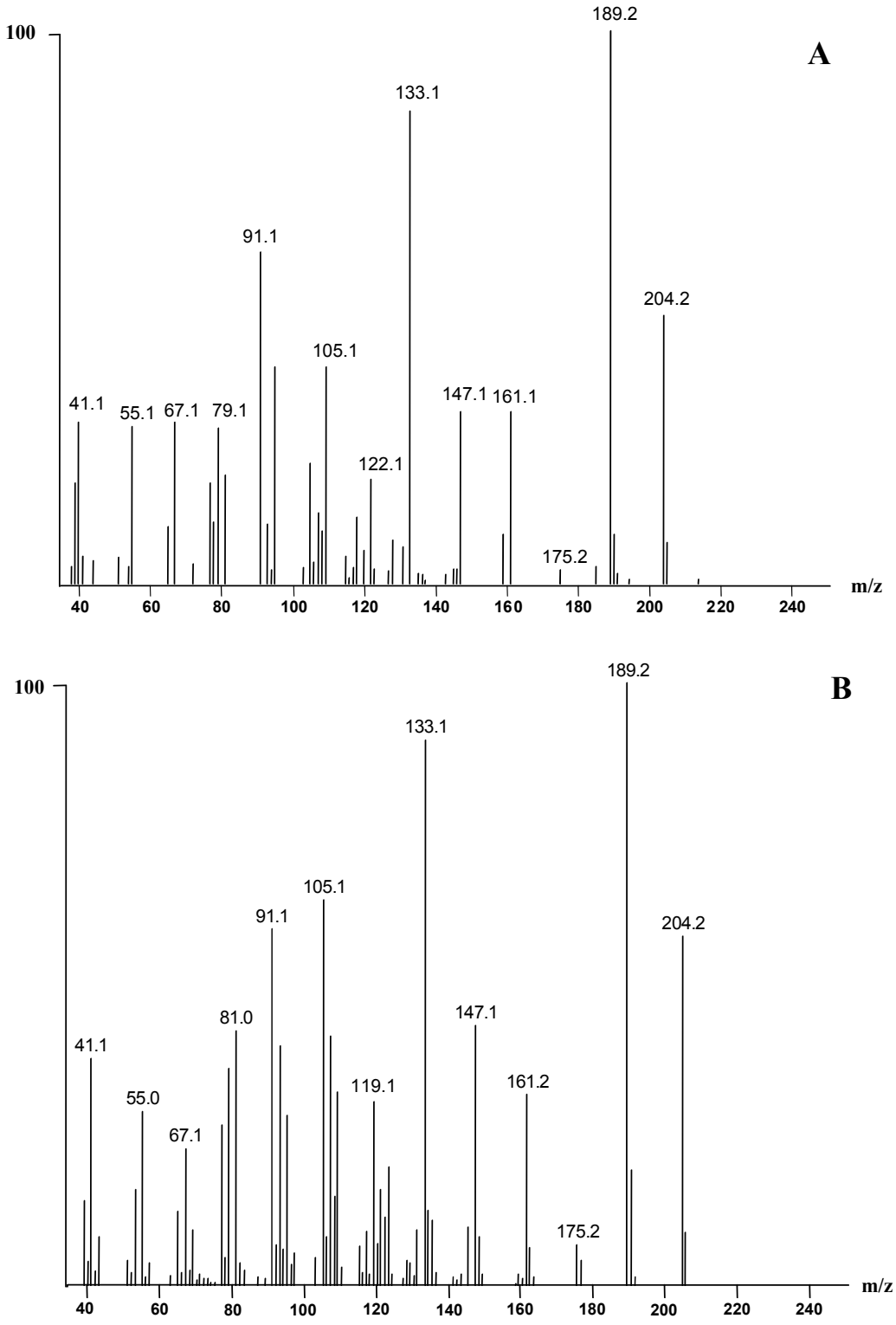

Figure S4: Mass spectra of product **7** from ASF178 catalysis (A) and of authentic α-selinene (B).

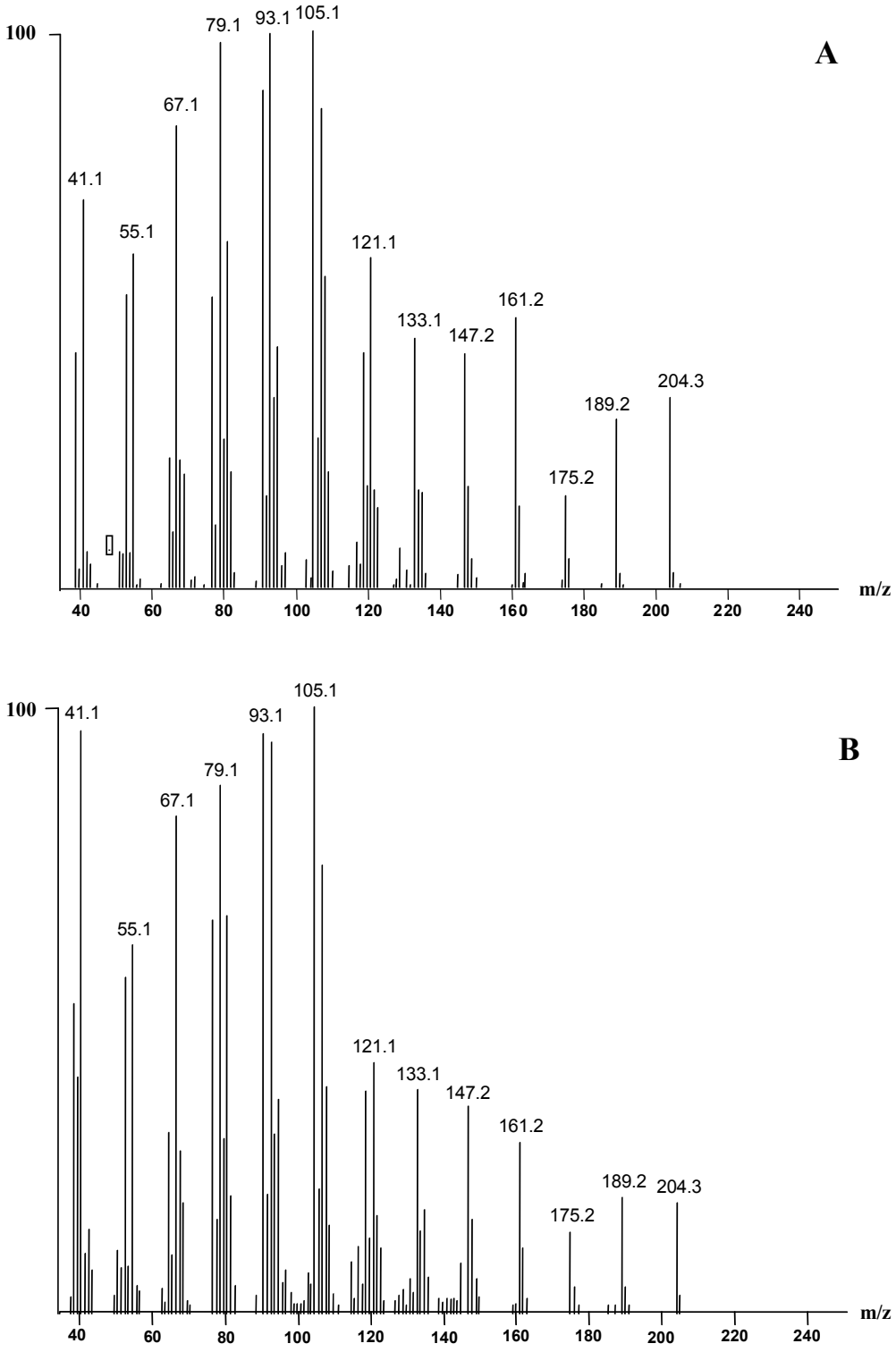

Figure S5: Mass spectra of product **8** from ASF178 catalysis (A) and of authentic β-selinene (B).

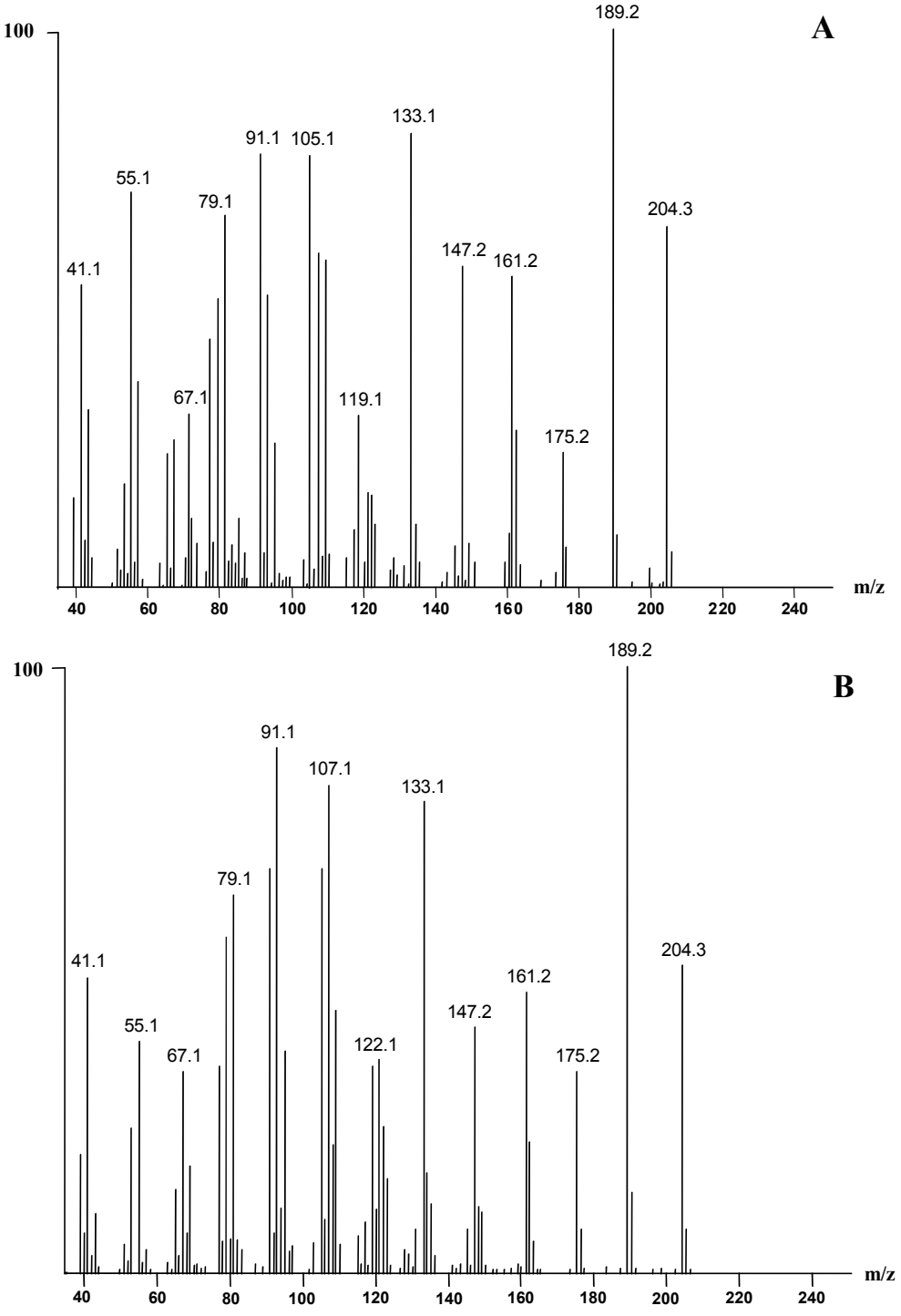

Figure S6: Mass spectra of product **9** from ASF178 catalysis (A) and of authentic selina-4,11-diene (B).

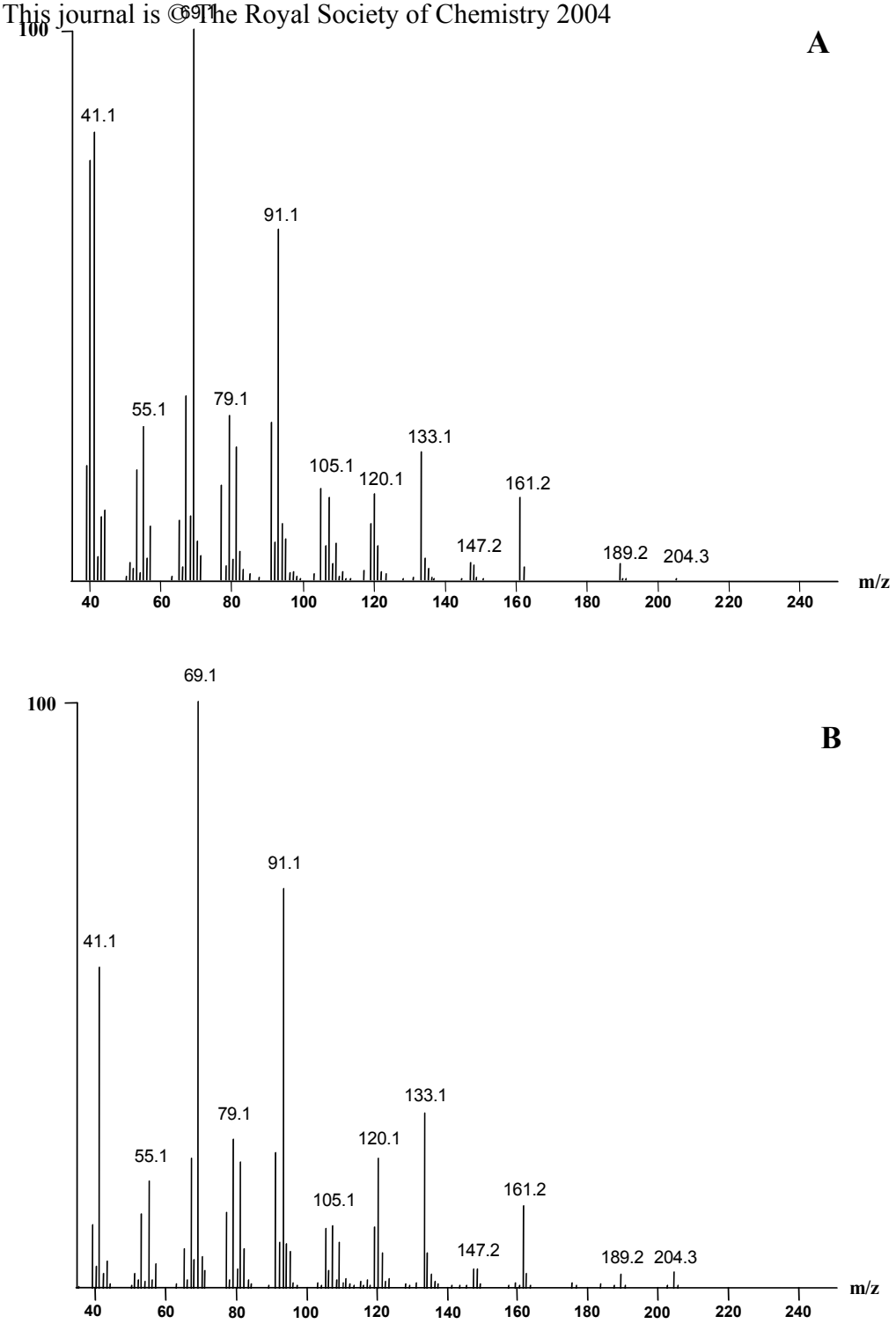

Figure S7: Mass spectra of product **10** from ASF178 catalysis (A) and of authentic (E)-β-farnesene (B).

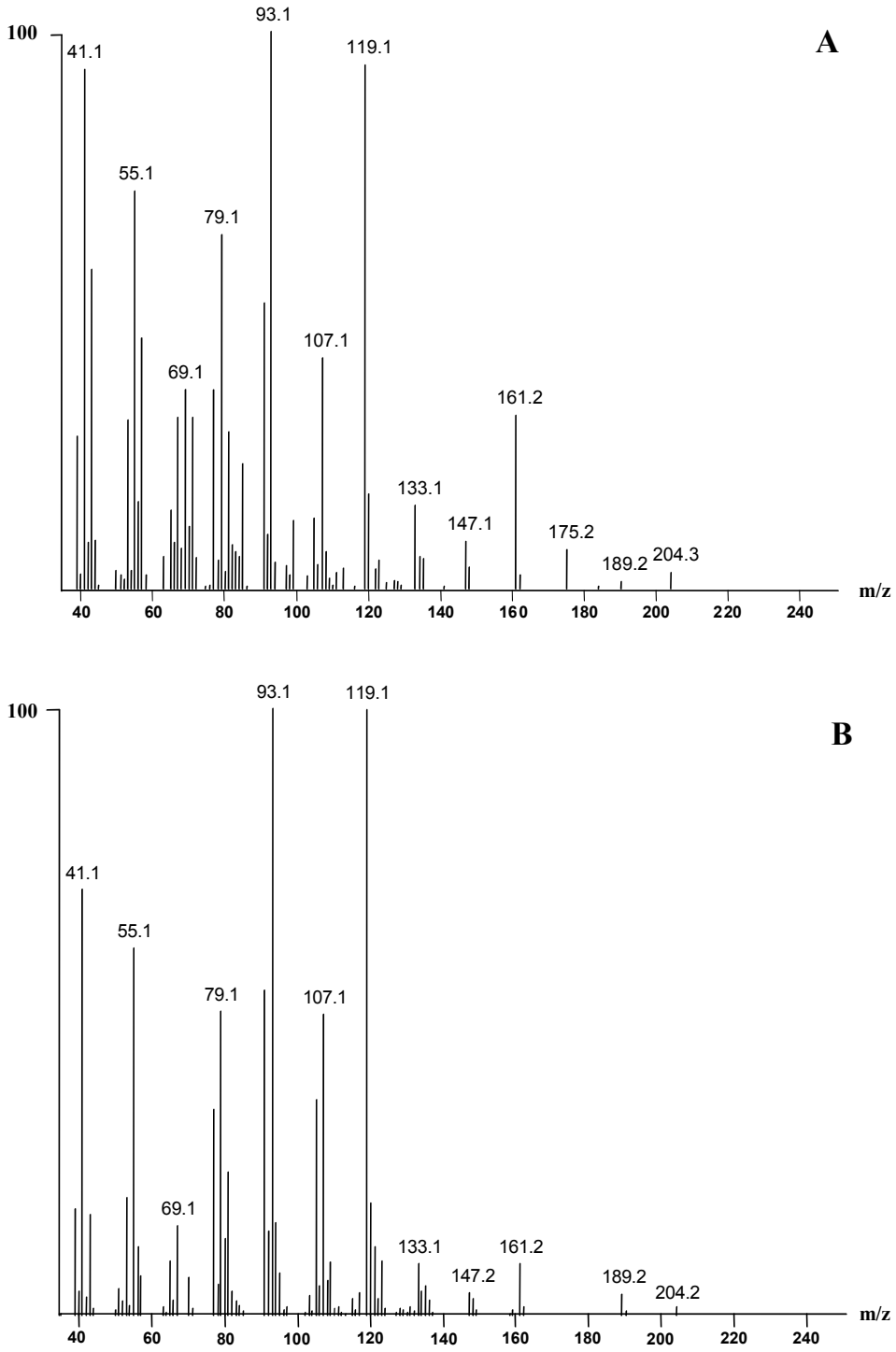

Figure S8: Mass spectra of product **11** from ASF178 catalysis (A) and of authentic (E,E)-α-farnesene (B).

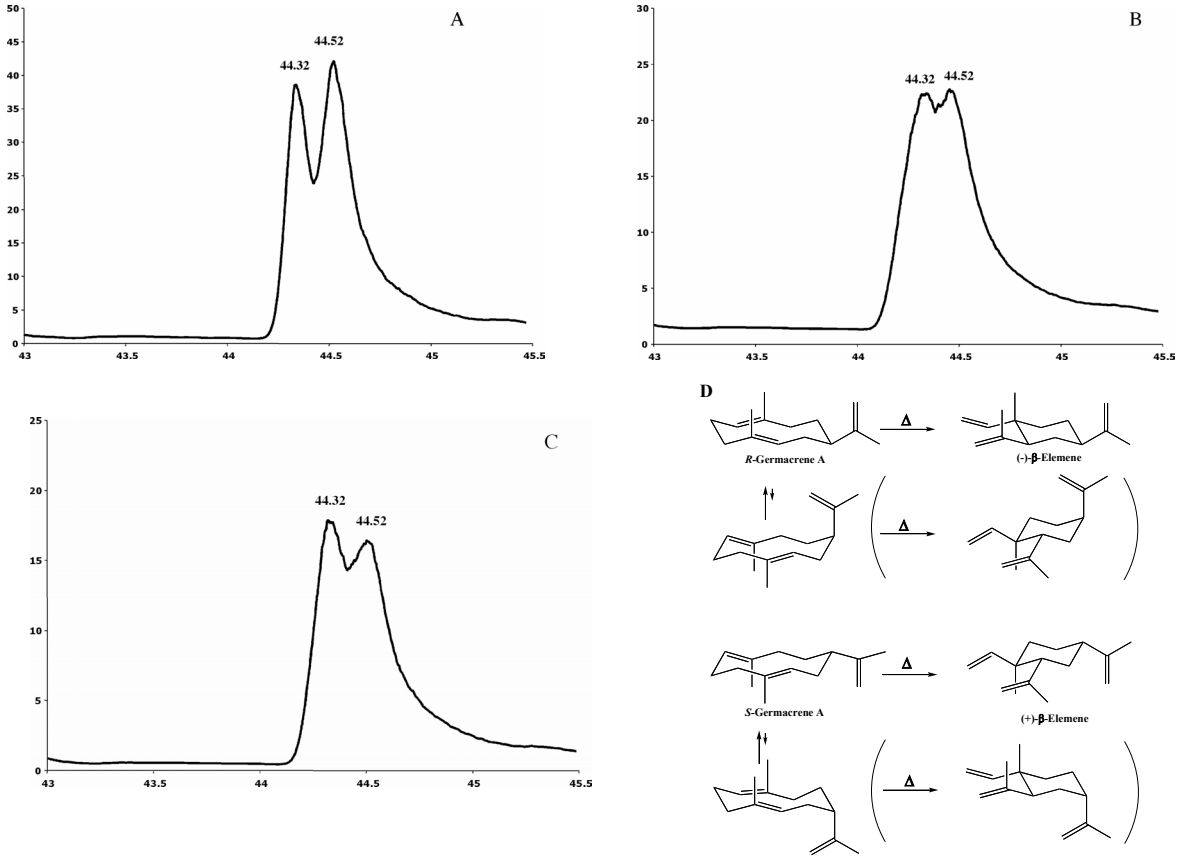

Figure S9: **Determination of the absolute configuration of germacrene A produced by ASF178V**. **A.** GC-trace of a racemic mixture of β-elemenes. **B**. GC-trace of a co-injection of racemic β-elemenes and the β-elemene produced from FPP by ASF178V. **C.** GC-trace of a co-injection of racemic β-elemenes and (+)-β-elemene produced from (*S*)-germacrene A. (*S*)-germacrene A was generated using wild type AS. **D.** Relation of (*R*)- and (S)-germacrene A to the β-elemenes formed in Cope rearrangements at increased temperatures. Method: The absolute configuration of germacrene A produced by ASF178V catalysis was determined using a GC equipped with a 30 m (0.25 mm) heptakis (-O-TBDMS-2, 3-di-O-methyl)-β-cyclodextrin (50% in OV17) chiral column. The method developed by de Kraaker et al.,[1] was used. Splitless injections

with an injector teperature of 250°C induced the Cope rearrangement of the enzymatically produced germacrene A.[2]

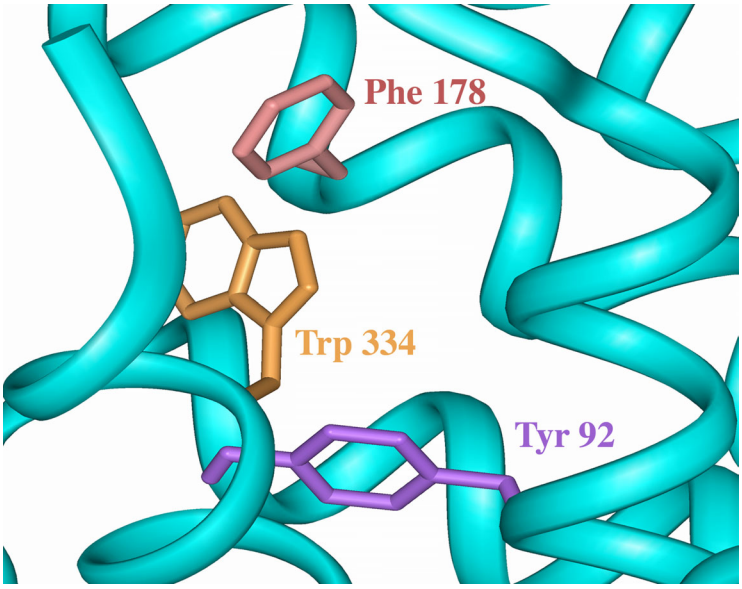

Figure S10: Relative orientation of residues Tyr 92, Phe 178, and Trp 334 in the active site of aristolochene synthase. Coordinates are from the X-ray structure of the apo-enzyme (pdb-file:1DI1).[3]

References

1 J.-W. de Kraaker; M. C. R. Franssen; A. de Groot; W. A. König; H. J. Boumeester, Plant Physiol., 1998, 117, 1381-1392 (Ref 14 in the main text).

2 M. J. Calvert; P. R. Ashton; R. K. Allemann, J. Am. Chem. Soc., 2002, 124, 11636 (Ref 6 in the main text).

3 J. M. Caruthers; I. Kang; M. J. Rynkiewicz; D. E. Cane; D. W. Christianson, J. Biol. Chem., 2000, 275, 25533.